

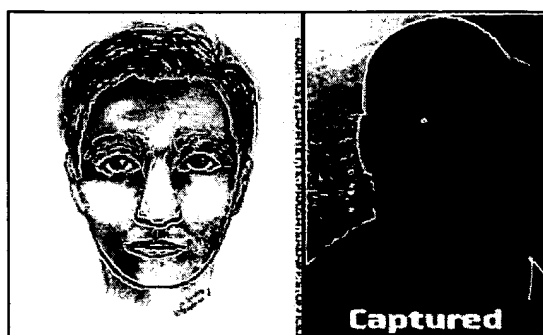
Genome Test Nets Suspected Serial Killer

By Nancy Touchette

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featured article

Police in Baton Rouge, Louisiana, realized this spring they had reached a dead end in the search for a serial rapist and killer. DNA gathered at crime scenes linked the murders of at least five women over an eighteen-month period. An eyewitness reported spotting a white male leave the vicinity of one crime scene in a white pickup truck. That and other reports led to a dragnet as police collected DNA samples from more than 1,000 white males.



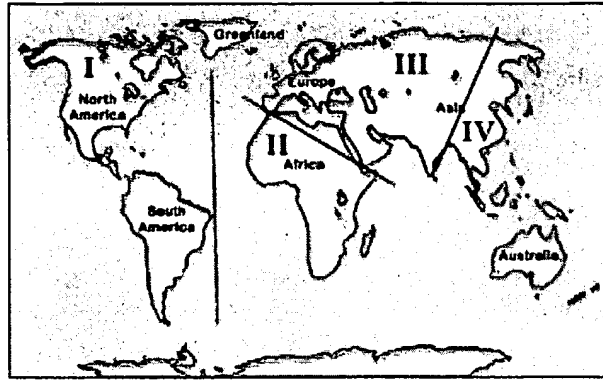
Police sketch of serial killer based on eyewitness accounts (left) and actual murder suspect, Derrick Todd Lee (right).
Courtesy Lafayette Parish Sheriff's Office and F.B.I.

But the dragnet turned up no matches. In March, as police contemplated their next move, they received an intriguing phone call from Tony Frudakis, head of a small genomic testing company in Florida. Frudakis promised he could provide a physical description of the killer based on a novel genomic test.

"They were looking for a needle in a haystack," says Frudakis. "The problem was they were looking in the wrong haystack."

The genomic test revealed that the killer's heritage was approximately 85 percent African and the rest Native American. That changed the focus from a white suspect to one of mixed racial heritage. Frudakis predicted that the killer would have a moderately dark skin tone.

Based on that prediction, police broadened their search to include black males and obtain a DNA sample from Derrick Todd Lee, a 34-year-old area resident with an extensive criminal record. Lee's DNA was an exact match to that found at the crime scenes. A warrant was issued and Lee was apprehended May 27. He is awaiting trial in Baton Rouge.



Admixture mapping indicates whether a person's heritage is Native American (I), African (II), Indo-European (III), or East Asian (IV).

Courtesy DNAPrint Genomics

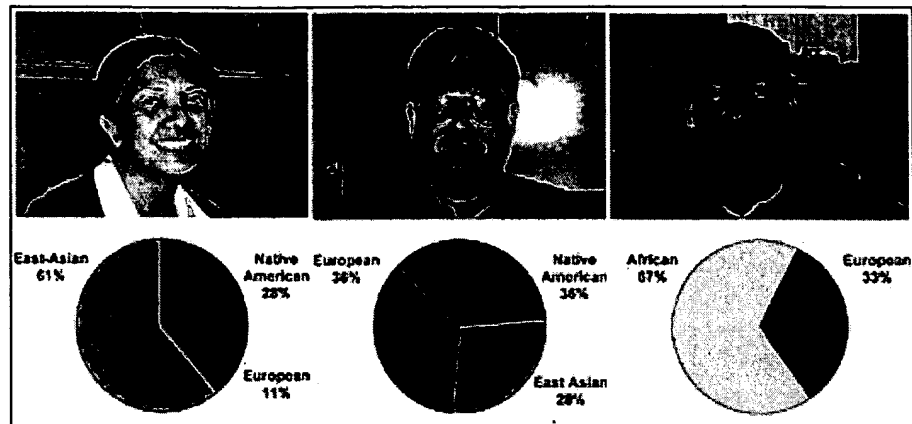
Frudakis' prediction was based on a technique called admixture mapping, a way of estimating a person's ancestry, or "biogeographic" heritage, based on their DNA. The technique was developed by Frudakis and Mark Shriver at the Pennsylvania State University and is being marketed by Frudakis' company, DNAPrint Genomics of Sarasota.

The test makes use of a set of 73 "markers"—segments of DNA that vary from person to person. Some of these markers are found primarily in people of African heritage, while other forms are found mainly in people of Indo-European, Native American, or South Asian heritage. By analyzing the frequency of the various markers, researchers can come up with an estimate of a person's heritage.

The company maintains a database of more than 300 photographs of people of various ethnic backgrounds. For any given ancestry estimate, clients can view photographs of people with similar heritage to get an idea of probable physical features, including skin tone, hair color, hair texture and facial structure.

DNA samples collected in the dragnet were analyzed using a different kind of test, called DNA fingerprinting, which is commonly used to match suspects to DNA collected from crime scenes. The DNA fingerprint test, also called a CODIS test, relies on 13 regions in the genome that contain stretches of DNA of varying lengths.

The test measures the lengths of all 13 regions for each person, which gives a person's unique profile or "DNA fingerprint." The likelihood that any two people share a given fingerprint is less than one in a million.



Ancestry estimates of three individuals in the DNAPrint Genomics database.
Courtesy DNAPrint Genomics

Frudakis believes the new admixture mapping technique could change the way criminals profiled and lead to more focused searches. Suspects are currently profiled by a combination of psychological and physical factors.

"If this test had been done at the beginning, they could have avoided the dragnet," says Frudakis. The admixture test costs \$1,000; DNA fingerprinting tests cost about \$600 to \$1,200 per sample.

DNA-based profiling could go well beyond estimates of ancestry. DNAPrint Genomics offers a service that can estimate eye color based on gene markers related to iris pigment genes.

Shriver has found a significant correlation between skin color and percentage of African ancestry. It is within the realm of possibility to provide other physical details—including hair color, hair texture, stature, and weight—based on markers near genes thought to influence these traits, he says.

"Ultimately in a criminal investigation, you want to get an idea of what the person looks like," says Shriver. "We have several markers and candidate genes in which we know something about the biology that dictates some of these physical traits."

More research is needed, he says, to ultimately find the actual genes that together affect a person's physical appearance.

DNAPrint Genomics has conducted more than 3,000 tests for a variety of clients. Many police departments have submitted known samples to test the accuracy of the test and a few departments have used the service to track criminals in active investigations. So far, no known errors have occurred, according to the company.

Frudakis says the company has been approached by other types of clients, including biomedical researchers conducting population studies and people interested in their ancestry for personal reasons.

For more about admixture mapping visit [DNAPrint Genomics](http://www.dnaprintgenomics.com)

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Shriver, M.D. *et al.* Skin pigmentation, biogeographical ancestry and admixture mapping. *Hum. Genet.* **112**, 387-399 (April 2003).

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